



Incidence of Neurosensory Alteration Post Articaine in Adult Patients at KAUFU

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Abstract: Objectives: Local anesthetics are associated with minimal side effects and complications. Several retrospective studies proved that Articaine 4% and Prilocaine 4%, are associated with paresthesia compared to the other local anesthetic agents in dentistry. However, limited prospective studies reported similar findings. The present study is a prospective observational study evaluating and comparing incidence of neurosensory alteration after Articaine 4% local anesthesia and comparing the findings to Lidocaine and Mepivacaine local anesthetic drugs. Materials and Methods: Patients undergoing dental procedures receiving local anesthesia Articaine 4%, Mepivacaine 3% and Lidocaine 2% were followed up and evaluated for altered sensory sensation on the third and seventh post-operative days. Results: The results proved that 2% Lidocaine was found to be the most common type of local anesthesia used (37.4%), followed by 2% Mepivacaine (29.3%), 4% Articaine (25.3%), and 3% Mepivacaine (8.0%) with no reported sensory alteration in any case. Conclusion: Articaine Hydrochloride 4% was found to be safe and effective to use in different dental procedures without any associated sensory nerve alteration.

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1. Introduction

Local anesthetics are considered the mainstay for pain control in dental practice due to its effectiveness and safe application.¹

There are minimal side effects and complications associated with dental anesthetics, either with risk or non-risk patients. However, the majority of these side effects are temporary and require no medical intervention or treatment.²

One of the local complications is paresthesia or prolonged anesthesia in the tongue or lip as a result of direct trauma to the lingual or inferior alveolar nerve respectively during surgical procedures. It also can occur after nonsurgical procedures. Although most of the cases are eventually resolved after eight weeks, some cases (minor) became permanently damaged. According to the reports, 4% Articaine and 4% Prilocaine local anesthetics were found to be associated with paresthesia in the non-surgical cases compared to the other local anesthetic agents in dentistry.^{3,4}

Many retrospective studies of paresthesia following the injection of local anesthetics reported that the formulations of these drugs may have the potential for mild neurotoxicity, furthermore, those same studies found that the incidence of paresthesia were slightly higher with Articaine and Prilocaine than the other local anesthetics.^{5,6}

Another retrospective study on patients with permanent nerve damage (>9 month) showed that lidocaine was associated with 35% permanent nerve damage, while 30% with Articaine resulted in 30% permanent paresthesia following inferior alveolar nerve block.⁷

The only prospective clinical trial we found in the literature had concluded that the difference in the incidence of immediate paresthesia post-injection using Articaine compared to Lidocaine is minimum. In addition, the incidence of paresthesia on 4-8-days follow-up period was found to be of no statistically significant difference between these two agents. Moreover, the incidence of paresthesia was found to be very rare and was also found to occur with the use of more than one type of local anesthetic agents.⁸

Although there is an increase in the number of reported cases of paresthesia with the use of Articaine, yet there is no scientific evidence that support this finding to date.¹ Moreover, the reported studies that suggested that paresthesia occurs more commonly after use of 4% local anesthetics namely (Articaine & Prilocaine) were retrospective and voluntarily submitted.^{6,9,10} Yet, the only prospective clinical trial found that the toxicity profile of Articaine was equivalent to that of lidocaine. It also found that Articaine was well-tolerated in subjects who received it.⁸

Aim of the work

The objective of the study was to evaluate the relation of Articaine local anesthetic drug to the incidence of neurosensory alteration and comparing the findings to Lidocaine and Mepivacaine local anesthetic drugs.

2. Materials and Methods:

A prospective observational study was conducted in KAUFU (King Abdul-Aziz University Faculty of Dentistry) dental clinics from January to March 2015. The study was based on patients who received local anesthesia for dental procedures, performed at KAUFU. Inclusion criteria were ASA I and ASA II patients who were going to have non-surgical dental procedures or simple extractions. Exclusion criteria were as follows: patients undergoing transalveolar exodontia, or other surgeries; pregnant females and pediatric patients (≤ 12 years old).

4th, 5th, 6th year students, interns, residents and consultants performed procedures. All data were collected pre-and postoperatively through a comprehensive questionnaire.

The questionnaire was divided into four main categories:

1. Demographic and biological data (name, age, gender, weight and nationality)
2. Medical condition (pregnancy, present illness, drugs, allergy and history of smoking)
3. Dental procedure details (vital signs, type of procedure, location, complications and post-operative drugs)
4. Local anesthetic used (generic name, concentration, vasoconstrictor use, amount, nerve anesthetize, type of administration and needle gauge).

Consent was obtained pre-operatively and procedures were explained to the patients. Patients were informed about follow up phone calls at third and seventh post-operative days, where they will be asked about any altered sensation such as paresthesia, tingling or complete anesthesia. Patients reporting altered sensation were instructed to attend the clinic for assessment at the seventh postoperative day.

Meanwhile any other postoperative symptom was ethically managed for the patient's professional care.

Clinical assessment of sensation (sensory function) was planned for all patients presenting with symptoms of alteration of sensation, according to the testing protocol for patients with decreased sensation without dysesthesia.

Techniques used for local anesthetics administration were infiltrations and inferior alveolar nerve block.

Procedures by students and interns were all performed under supervision from faculty staff and consultants to ensure proper technique used.

Gathered data were statistically analyzed using IBM SPSS version 20 to evaluate the relationship of the sensory alteration occurring with the use of Articaine in comparison to other Lidocaine and Mepivacaine.

3. Results:

Throughout the study period extended from January to March 2015, a total 174 patients attended the outpatients clinics of KAUFU were subjected to our study. Female to male ratio was found to be 3:2 (Figure 1) with age ranged between 13 and 90 years old. Only 31.5% of male patients and 31% of female patients had a medical condition (Table 1).

Table 1. Percentages and number of patients who had a medical condition in KAUFU.

	smoker	Allergy		Diabetes		Hypertension	Asthma	Cancer	Hyperthyroidism	hypothyroidism	CVSD	Anemia	Hyperlipidemia	Others	
		food	penicillin	Type I	Type II										
Male	count	12	2	0	4	12	9	2	0	0	0	3	1	1	0
	%	17%	3%	0.0%	6%	17%	13%	3%	0.0%	0.0%	0.0%	4%	1.5%	1.5%	0.0%
Female	count	3	3	2	2	9	9	6	3	2	2	3	6	2	5
	%	3%	53%	2%	2%	9%	9%	6%	3%	2%	2%	3%	6%	2%	5%

2% Lidocaine with 1:100000 epinephrine was found to be the most common type of local anesthesia used (37.4%), followed by 2% Mepivacaine (29.3%), 4% Articaine, (25.3%), and 3% Mepivacaine (8.0%).

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Of all the inferior alveolar nerve blocks, lidocaine was used in 36% of the cases while Articaine and 2% Mepivacaine were used in 26.7% each. Infiltration anesthesia on the other hand was achieved with lidocaine in 38.4% of the cases compared to 24.2% and 31.3% of the Articaine and 2% Mepivacaine respectively. (Table 2).

Table 2. Percentages of infiltrations as well as inferior alveolar nerve blocks of all the local anesthetic agents used in KAUFU.

		4% Articaine w/ epinephrine	2% Lidocaine w/ epinephrine	2% Mepivecaine w/ epinephrine	3% Mepivecaine w/o epinephrine	Total
IANB	count	20	27	20	8	75
	%	26.7%	36%	26.7%	10.6%	100%
Infiltration	count	24	38	31	6	99
	%	24.2%	38.4%	31.3%	6.1%	100%

54.5% of the Articaine was given to young patients (age range 12-30 years old), and 29.5% was given to older patients (31-50 years old). Furthermore, 45.5% of the total Articaine administered was given to the mandibular posterior area. On the other hand, 41.5% of the total lidocaine administered was given to the same zone. The incidence of paresthesia was found to be 0% using all types of local anesthetic agents.

4. Discussion:

This study was held from January to March 2015, samples were randomly selected from different academic levels from both genders in 4th, 5th, 6th, interns, and consultants from dental clinics at King Abdul-Aziz university dental hospital to reflect real life including different patient's age, gender, and different dental clinics.

Our school policy for treating patients ASA I and ASA II only, any serious medical complications or uncontrollable cardiac diseases and renal failure, hepatic failure, trans-alveolar exodontia or other surgeries were excluded to avoid misleading results. Non-surgical procedures were excluded to avoid any confusing results that could be attributed to traumatic nerve injury. This agrees with previous studies who reported that one of the local complications associated with surgical procedures is paresthesia or prolonged anesthesia in the tongue or lip as a result of direct trauma to the lingual or inferior alveolar nerve.^{3,4}

Moreover, pediatric patients were excluded (≤ 12 years old) since the sensation of paresthesia is objective, the reported paresthesia by pediatric patients can be misleading. Vital signs were preoperatively checked in all cases, procedures were established in normal baseline vital signs.

The questionnaire includes a checklist for any intraoperative complication in order to identify any additional factor that might cause paresthesia. Only one case with intraoperative root fracture was reported during this study.

Throughout the literature reviewed^{1,8,11} reported that Articaine is safely used for dental treatment, especially when compared with other types of LA drugs. On the other hand, some retrospective studies⁵⁻⁷ contradict the use of Articaine particularly regarding

its neurotoxicity tendency. Accordingly, our study was designed to evaluate and compare the effect of Articaine to Lidocaine and Mepivacaine local anesthetics on the occurrence of sensory alteration.

We have studied the impact of different local anesthetic drugs Articaine, Lidocaine and Mepivacaine Hydrochloride in a total number of 174 subjects (70 males and 104 females) on sensory alteration among different dental procedures. Drugs included in this study were: 4% Articaine with epinephrine 1:100,000, 2% lidocaine with epinephrine 1:100,000, 2% Mepivacaine with epinephrine 1:100,000, and 3% Mepivacaine without epinephrine.

Our results proved that Articaine was well-tolerated in 44 subjects (22 males and 22 females), and that it provided clinically effective pain relief during most dental and surgical procedures without any post-operative paresthesia. In a similar study, Malamed and colleagues⁸ compared the safety and efficacy of 4% Articaine and 2% Lidocaine, both with epinephrine 1:100,000, both anesthetic drugs, they demonstrated clinically safe and effective local anesthesia during general dental procedures with comparable adverse events to our work, including post-procedural pain, headache, facial edema, gingivitis, and transient paresthesia. A further finding^{11,12} agrees with our results, advocating that Articaine can be used effectively for all dental procedures in both adults and children.

Patients received adequate anesthetic drug for pain control, the amount was calculated for each nerve division separately according to the area anesthetized. Also, the weight and dose were measured to calculate the maximum dose for each patient, none of the operators exceeded the maximum dose for local anesthetic with any patient.

The results were affected by the limited number of use of Articaine in our study (25.3%) due to Faculty staff preference towards the use of any of the other available local anesthetic drugs.

In other retrospective studies, there were no reported cases of paresthesia in the maxilla with all types of local anesthetic agents used. On the other hand, the incidence of paresthesia with the IANB using 4% Articaine was (34-60%), the majority of

cases involved lingual nerve paresthesia (71-93%).^{12,13,14,15} Contradictory to our findings,^{7,12} in their study reported incidence of permanent paresthesia of inferior alveolar nerve and lingual nerve after inferior alveolar nerve block using Articaine, Lidocaine, Mepivacaine, and Prilocaine with the majority of cases of paresthesia after using Articaine and Prilocaine. In the current study, there was no paresthesia reported in either jaw regardless of the type of the local anesthetic agent used.

Conclusion:

According to the available data, Articaine Hydrochloride was found to be safe and effective to use in different dental procedures. Moreover, it showed that there is no incidence of paresthesia as well as the other types of local anesthetics used in this study. Due to the small sample size in our study, future studies with larger sample size are recommended.

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